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ORIGINAL ARTICLE

Comparison of CT Angiography and Intra-Operative Findings of Renal Vascular Anatomy in Living Donor Kidney and its Diagnostic Accuracy

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ABSTRACT

Background: The treatment of choice for end-stage renal disease is renal transplantation, which can be done from living or deceased donor. Living donors with multiple vessels lead to higher risk of allograft dysfunction. To select the patient and the kidney to be harvested, renal donors are radiologically evaluated before surgery. Multidetector-row computed tomography (MDCT) angiography is minimally invasive & has the advantage of assessing the main vessels (renal vein, renal artery), ureteral structure, renal parenchymal lesions, renal cystic diseases, tiny stones & surrounding anatomic variants with one test.

Study objective: To assess the accuracy of CT angiography in predicting the anatomy of renal vessels

Design: Retrospective study on 70 patients.

Sample/population: Patients who underwent open/ laparoscopic live donor nephrectomy in SMS Hospital, Jaipur

Duration of study: 2 years & 6 months

Results & Conclusion: CT angiography helps in accurately mapping the vascular anatomy, strategic planning of the surgery in terms of vascular dissection and helps in avoiding vascular complications.

Key words: CT angiography, Donor nephrectomy, Renal transplantation, Renal vascular anatomy.

INTRODUCTION

The treatment of choice for end-stage renal disease is renal transplantation, which can be done from living or deceased donor. Although, majority (>95%) of kidney transplantation are from living donors. It is essential to perform anatomical vascular evaluation of the donor kidneys to determine the suitable surgical approach and select the kidney to be used[1].

In living donor renal transplantation, preoperative anatomic and functional evaluation of donor kidneys for selection of a suitable donor is necessary for planning surgery, to decrease hospital stay and blood loss by reducing complications and to accelerate recovery[2,3]. Renal transplantation with living donors having multiple renal vessels carries higher risk of allograft dysfunction and thereby also carries poor long-term prognosis in the recipient. This is because multiple vessels require more anastomosis time, prolongs warm ischemia time and resulting in poor graft outcome.

To select the patient and the kidney to be harvested, renal donors are radiologically evaluated before surgery. Precise preoperative vascular mapping is required in donors with multiple renal vessels. There has been a revolution in the technology with respect to the quality of three-dimensional (3D) images and the speed of scanning with the introduction of multi-detector row computed tomography (MDCT). Even though CT and magnetic resonance (MR) imaging have comparable accuracy, CT has a higher resolution than MR and is more technically robust. For living kidney donation, assessment of potential renal donors can be done by a minimally invasive and well-established method, which is Multidetector-row computed tomography (MDCT) angiography. It is a minimally invasive and well-established method for assessment of potential renal donors and obtaining kidney anatomy for the purposes of living kidney donation[4-9]. MDCT angiography has the advantage of assessing the main vessels (renal vein, renal artery), ureteral structure, renal parenchymal lesions, renal cystic diseases, tiny stones & surrounding anatomic variants with one test[7,10]. CT angiography has 100% sensitivity identifying accessory arteries and 93% sensitivity identifying pre-hilar arterial branches.

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There is a dearth of evidence regarding the accuracy of detecting the vascular anatomy by CT angiography. The accuracy of determining the vessel structure by CT angiography has been assessed in earlier studies. The accuracy for the main vessels was reported to be 90% to 100% and that for the minor vessels was 75% to 100%[11-13].

Therefore, in our study, we retrospectively analyzed the accuracy of vessel structures obtained by CT angiography compared with the actual vessel structure observed during surgery.

AIMS AND OBJECTIVES

1. To compare the CT angiography findings on the operated side with the intraoperative findings.
2. To assess the accuracy of CT angiography in predicting the anatomy of renal vessels.

METHODS

With appropriate clearance from Institutional Ethics Committee, this single center analytical, retrospective study was done on 70 consecutive patients who underwent open/laparoscopic live donor nephrectomy from December 2019 to May 2022.

MDCT (Multidetector computed tomography) renal angiography was done in all donors pre- nephrectomy. All patients were scanned from the dome of the diaphragm down to the pelvis by a 128-slice MDCT scanner. The contrast medium used was low osmolar non-ionic contrast medium (IOHEXOL) containing 300 mg/ml of iodine, was injected through the peripheral venous line via a pump injector with a volume range between 120 and 150 ml (according to the patient's weight 1.5–2 ml/kg). MDCT comprises of unenhanced, arterial, nephrographic and delayed phases. The unenhanced phase has a goal to locate the kidneys, rule out calculi and provide a baseline analysis to compare the enhancement of subsequent lesions. Contrast-enhanced CT was initiated 30 seconds, 55 seconds, and 10–15 min after the injection to coincide with the arterial, venous and excretory phases, respectively. For arterial and nephrographic phases, a minimum of 1-mm sections were used for a better visualization of accessory renal arteries.

The assessment was done for the presence of number of arteries, early branching arteries, and accessory arteries. Accessory renal arteries are independent of the main renal arteries and have a discrete origin from the aorta or iliac arteries. Diagnosis of an early branching renal artery is made, when a branch diverges within 2.0 cm in the retrocaval segment (right kidney) or from the lateral wall of the aorta (left kidney). Venous anatomy was evaluated in the arterial phase and in addition by images in the nephrographic phase, especially for assessment of accessory renal veins, which sometimes enhanced later.

The findings of CT scan from the stored archives of our hospital were noted. The parameters noted in the CT angiography were artery and vein number on each side, any pre-hilar branching, relationship of the artery to the vein and other morphological abnormalities or any other incidental findings.

EXCLUSION CRITERIA for kidney donation was:

Donors with a history of-

1. Diabetes mellitus
2. Hypertension requiring 3 or more anti-hypertensives
3. Morbid obesity >35kg/m2
4. Active drug abuse
5. Psychiatric disorders
6. Positive virology
7. Significant cardiovascular disease

Donor nephrectomy was done after approval by the transplant board of the hospital and after due clearance from the regulatory authorities. Donor nephrectomy was done using an open/laparoscopic approach. The intraoperative findings noted were the artery and vein number, pre-hilar branching.

The findings on CT were compared with the intraoperative findings on the operated side.

Details about the vascular anatomy and morphology variations were abstracted.

STATISTICAL ANALYSIS

Chi-square test was used to compare the variables among the groups, and a p-value of <0.05 was considered significant. SPSS ver. 20.0 was used for performing the statistical analysis.

RESULTS

Of the 70 patients who underwent live donor nephrectomy, 46 were females and 24 were males. 69 patients underwent left donor nephrectomy and one patient underwent right donor nephrectomy. Laparoscopic left donor nephrectomy was done on three male patients and five female patients, out of 70 patients. Of the 70 patients who underwent donor nephrectomy, single renal artery and single renal vein were present in 16 (23%) male patients and 33(47%) female patients which accounts for total of 49 (70%) patients. 12 (18%) females and 4 (6%) males had double renal artery. Double renal vein found in two male donors. Two male patients had both double artery and vein. Triple renal artery was found in four male patients and one female patient, triple renal vein was found in none of the patients. Single renal artery and vein was found in patient who underwent open right donor nephrectomy. (Table 1) The CT scan was able to identify pre-hilar branching in five patients, with similar intra-operative finding. The CT angiogram showed retro aortic left vein in two patients and circumaortic renal vein in one patient. (Table2)

Single renal artery and vein were found in 72.8% patients on CT while intra-operatively it was found in 70% patients. Double artery was found in 24.28% patients on CT and 22.85% intra-operatively. Triple artery was found in 2.8% on

CT and 7.2% intraoperatively. Double vein was found in 1.4% patients on CT and 2.8% intraoperatively. (Table 3)

The positive predictive value for single artery was (96.08%), single vein (98.55%), double artery (82.35%), double vein (100%) and triple artery (100%) and negative predictive value in our study for single artery (100%), single vein (100%), double artery (96.23%), double vein (98.55%) and triple artery (95.59%). (Table 4)

The CT angiography findings of renal vascular anatomy in living kidney donor was found accurate and statistically similar to intra-operative findings. (p<0.001)

Table 1: Representing intraoperative statistics

	Male (%)	Female (%)
Number	24 (34%)	46(66%)
OLDN	20 (28.6%)	41(58.6%)
ORDN	01 (1.4 %)	0
LLDN	03 (4.3%)	05 (7.1%)
LRDN	0	0
Single artery	16 (22.8%)	33 (47.1%)
Double artery	04 (5.7%)	12(17.1%)
Triple artery	04 (5.7%)	01(1.4%)
Single vein	22(31.4%)	46(65.7%)
Double vein	02 (2.8%)	0

OLDN: Open left donor nephrectomy, ORDN: Open right donor nephrectomy

LRDN: Laparoscopic right donor nephrectomy, LLDN: Laparoscopic left donor nephrectomy

Table 2: Exclusive CT findings on arterial and venous anatomy (70 cases)

	Male	Female
Single artery and Single vein	16 (23%)	35(50 %)
Double artery and single vein	05 (9%)	11(16%)
Double vein and single artery	0	0
Double artery and double vein	01 (1.4%)	0
Triple artery	02 (3%)	0
Triple vein	0	0
Pre-hilar branching	01 (1.4%)	05 (7.14%)

Table 3. Vascular anatomy correlation in CT vs surgery

	CT findings	Intra operative finding
Single artery	51	49
Single vein	69	68
Double artery	17	16
Double vein	01	02
Triple artery	02	05
Triple vein	0	0

Table 4. Comparison of vascular anatomy between CT & surgery

	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
Single artery	100	90.48	96.08	100
Single vein	100	50	98.55	100
Double artery	87.5	94.44	82.35	96.23
Double vein	50	100	100	98.55
Triple artery	40	100	100	95.59

DISCUSSION

A pair of arteries which arises from the abdominal aorta at the level of the L1 to L2 vertebral bodies, below the origin of the mesenteric artery supply the kidneys in most individuals. At the hilum of the kidney, each renal artery splits into anterior and posterior branches (pre-segmental arteries). Its further divides into segmental arteries to supply the respective segments of the kidney (apical, upper, middle, inferior and posterior). Accessory renal arteries can commence from the abdominal aorta as low (inferiorly) as the internal iliac artery or above the main branch. A frequent variant is when the main renal artery divides prior to reaching the hilum of kidney. This condition is named as extra-hilar branching and when it takes place within 1.5 cm of the renal ostium in the abdominal aorta, it is called early branching. [4] Since most surgeons require minimum 2-cm length of renal artery prior to hilar branching to assure adequate control and anastomosis, so it is crucial to recognize any pre-hilar branching. [5] The most frequent accessory artery is a polar artery arising from the aorta, close to the origin of the main renal branch, and supplies the inferior renal pole. The upper pole, which is normally a small segment is irrigated by the second most frequent supplementary artery. Considerably more variants of veins can be discovered as compared to the arterial side. The most common is the existence of multiple renal veins, which occurs in 15 %–30 % of patients. [6] The most characteristic variant of the left renal vein is the circumaortic renal vein (17 % of patients), as it embraces the ventral and dorsal aorta.

The pre-operative imaging of living renal donors is required to detect renal anomalies so as to select candidates for living renal transplantation, to reduce the risk of surgical complications that can endanger survival of the graft or donor's life. Moreover, the length and the width of the accessory vessel on a CT angiogram aids in

deciding the surgeon the side of donor nephrectomy, and whether to forfeit or save the accessory vessel. The surgeon can decide the side of the donor nephrectomy by seeing early branching, which is seen well on 3D images. Detection of an accessory vessel and its course helps surgeons to avoid inadvertent laceration of an accessory vessel, which results in a focal renal infarct.

In our study, the incidence of single renal artery and vein was 70% which was higher than the literature. The incidence of double renal artery was 23% in our study, which was higher in comparison to the study by Shetty et al.[14] who reported the incidence rate of 17% on the left side.

In our study, the positive predictive value for single artery (96.08%), single vein (98.55%), double artery (82.35%), double vein (100%) and triple artery (100%) and negative predictive value in our study for single artery (100%), single vein (100%), double artery (96.23%), double vein (98.55%) and triple artery (95.59%).

In a study by Shetty et al. [14] the positive predictive value and negative predictive value for venous anatomy in left side correlation was 99.5%. Similarly for arterial anatomy in left side it is was 96.8%. It was 100% for arterial and venous anatomy in the right side.

Pozniak et al.[4] mentioned that sensitivity and specificity for identifying specific vessels was 99.6% and 99.6% for main renal arteries, 76.9% and 89.9% for polar arteries, and 98.7% and 95.5% for main renal veins, respectively.

Satomi et al. [5] found that CT and surgical findings were accurate in 96% of cases for arteries and 99% of cases for veins. Our results are comparable to those from recently published articles about studies of multi-detector row CT in evaluating potential renal donors.

Kim et al.[15] reported that in their series of 77 renal donor's multi-detector row CT had an overall depiction rate of 98% (89 of 91 arteries and 83 of 85 veins).

In general, the prevalence of renal vascular abnormalities in our study was comparable to that found in other studies.

CONCLUSION

Donor nephrectomy requires vital information regarding the vascular anatomy of the kidney. CT angiography helps in accurately mapping the vascular anatomy. CT renal angiography helps in strategic planning of the surgery in terms of vascular dissection and helps in avoiding vascular complications. The incidental findings detected by CT angiography can also help in holistic management of the patient in donor nephrectomy.

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ORIGINAL ARTICLE

Cognitive Performance in Treatment Naive Adults having Obsessive Compulsive Disorder – A Hospital Based Cross-Sectional Study

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ABSTRACT

Background: Obsessive-compulsive disorder (OCD) is a neuropsychiatric disorder occurring in childhood and early adulthood, characterized by obsessions and compulsions. Impaired cognitive functions are reported in adults having OCD. They could be biomarkers for vulnerability to OCD. There is lack of published Indian literature in this area. Hence, present study was planned to assess the range and severity of cognitive function deficits in OCD.

Aim: To assess the cognitive performance (Motor and Processing speed, Spatial Working Memory & Visuoconstructive Memory) in patients having OCD.

Methods: 50 patients having OCD aged between 18-45 years formed the sample. After obtaining informed consent & recording sociodemographic data, severity of OCD was assessed on Yale Brown Obsessive Compulsive Scale (Y-BOCS). Colour Word Interference Test (CWIT), Rey-Osterrieth Complex Figure Test (ROCF) and Trail Making Test A and B (TMT) were used to assess motor and processing speed, visuoconstructive memory and Spatial working memory respectively. Results were compared within the groups and with normative data. IBM SPSS version 22 for windows was used to analyze the data.

Conclusion: OCD is associated with deficits in cognitive performance wherein age, gender, education, and severity of OCD play a significant role.

Key words: Cognitive performance, Obsessive Compulsive Disorder, Treatment Naïve.

INTRODUCTION

Obsessive-compulsive disorder (OCD) is a neuropsychiatric disorder characterized by intrusive thoughts, images or impulses/urges and/or time-consuming repetitive behaviors, including repetitive mental acts, leading to significant functional impairment and distress[1]. OCD affects both genders and disables the entire lifespan. OCD generally presents in childhood and early adulthood. Lifetime prevalence of OCD is estimated to be 2.3% while 12-month prevalence is 1.2%[2].

Obsessive thoughts and compulsive behaviors may also be observed in the general healthy population. About 80% of the general healthy population may occasionally experience obsessive, unpleasant and unwarranted thoughts which are generally labeled as subclinical Obsessive Compulsive (OC) tendencies, however most people do not infer these thoughts as harmful or act on them[3].

The individuals having OCD interpret the obsessive thoughts differently from unaffected individuals. These thoughts are supposed to have a cause of recurrence as per the individual suffering from OCD who interpret them as detrimental/injurious and thus try to defy such thoughts[4,5].

OCD has similar nature, character and content as a normal obsession but these thoughts present for a longer duration, greater intensity and with high recurrence in OCD individuals and thus lead to higher distress and anxiety[4, 6, 7].

OCD is associated with wide range of cognitive function deficits. Such cognitive functions include motor & processing speed, spatial working memory and visuoconstructive tasks. Adults diagnosed as having OCD have been reported to show deficits in visuospatial abilities, executive functions, verbal memory, verbal fluency and attention[8].

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METHODS

- **Source of data-** Patients diagnosed as having OCD according to DSM V criteria, in the age group of 18-45 years seeking treatment from OPDs of hospitals attached to a medical college in Karnataka formed the sample of the study.

- **Study period-** January 2021 to July 2022

- **Study design**- This was a hospital based cross sectional study.

‒ Patients who meet the inclusion criterion and did not get excluded were recruited to the study by consecutive sampling.

- **Inclusion Criteria**-

‒ Patients diagnosed as having OCD as per DSM- 5

‒ Age between 18-45 years

‒ Both genders.

‒ Minimum education upto 5th standard.

‒ All the patients who gave informed consent to participate in the study were included.

- **Exclusion Criteria-**

‒ Presence of psychiatric co morbidity other than mood syndromes secondary to OCD.

‒ Associated major medical illnesses.

‒ Alcohol and Substance use disorder.

‒ History of treatment for OCD.

- **Sample size**- 50

- **Assessment Tools**-

‒ Informed Consent Form.

‒ Self-designed Proforma to elicit Socio demographic data.

‒ Severity of OCD was assessed using Yale Brown Obsessive Compulsive Scale (Y-BOCS).

‒ Motor & Processing Speed was assessed using Color Word Interference Test (CWIT).

‒ Spatial Working Memory was tested by Trail Making Test.

‒ Visuoconstructive Memory by Rey Osterrieth Complex Figure Test (ROCF).

- **Statistical Analysis-**

Categorical data is represented in the form of frequency and percentage. Association of variables was assessed with Chi Square Test. Quantitative data is represented as Mean and Sd. Comparison was done with unpaired t Test. P value of <0.05 was considered

statistically significant. ANOVA test and Mann-Whitney U test were also applied to see significance. IBM SPSS Version 22 for Windows was used for analyzing data.

RESULTS

Table I - Sociodemographic data of sample

Socio-demographic	Range	Group-A	Percent %
Age in years	18-27 years	21	42
	28-36 years	13	26
	37-45 years	16	32
Gender	Male	22	44
	Female	28	56
Education	Upto PUC	28	56
	Degree or diploma	22	44
Total	Each Category	50	100

The group had most people in the younger age group of 18-27 years (n=21, 42%). Females formed larger part of the sample (n=28, 56%). Most patients had studied upto PUC (n=28, 56%).

Table II - Y-BOCS severity

Severity of OCD on Y-BOCS	No. of cases	Percent (%)
Mild	0	0
Moderate	38	76
Moderate-severe	12	24
Severe	0	0

Patients were in moderate and moderate-severe range of Y-BOCS.

Table III - Age and cognitive function

| Cognitive Functions | Age | | | ANOVA | |
	18-27 (n=21)	28-36 (n=13)	37-45 (n=16)	P value	Significance
CWIT Word	20.7 ± 9.6	18.7 ± 5.57	24.7 ± 10.9	0.21	NS
CWIT Color	48.1 ± 9.9	23.5 ± 6.5	56.7 ± 19.5	0.246	NS
TMT-A	39.2 ±15.2	25.7 ±7.7	29.9 ± 11.9	P<0.003	HS
TMT-B	85.0 ± 33.2	57.1 ± 15.1	60.8 ± 28.4	P<0.005	HS
ROCF AT REGISTRAT	34.5 ± 0.98	35.1 ± 1.3	34.6 ± 1.45	0.386	NS
ROCF at 3 MIN	17.6 ± 4.99	18.7 ± 6.2	19.0 ± 5.5	0.73	NS
ROCF at 30 MIN	16.7 ± 4.7	17.4 ± 6.1	16.1 ± 5.8	0.82	NS
NS = NOT SIG, HS = HIGHLY SIG,					

On comparing cognitive functions of patients with the age groups, highly significant correlation was observed on Trial Making Test A (39.2 ±15.2 sec) and B (85.0 ±33.2 sec) with poorer performance observed in the younger age group (18-27 years) compared to other two groups. No significant differences on other test performance were observed with age.

Table IV - Gender and cognitive function

Cognitive Functions	Male (n=22)		Female (n=28)		Unpaired t Test	
	Mean	Std. Deviation	Mean	Std. Deviation	P value	Significance
CWIT Word	19.68	5.79	22.86	11.25	0.234	NS
CWIT Color	58.98	12.54	44.93	16.32	P<0.002	HS
TMT-A	31.79	14.42	32.30	13.57	0.9	NS
TMT-B	75.85	25.05	65.40	33.64	0.23	NS
ROCF AT REGISTRATION	34.45	1.18	34.86	1.27	0.257	NS
ROCF at 3 MIN	17.07	4.61	19.36	5.85	0.139	NS
ROCF at 30 MIN	15.82	4.52	17.34	5.97	0.327	NS
NS = NOT SIG, HS = HIGHLY SIG,						

On CWIT test colour naming subtype females took significantly lesser time than males indicating better performance.

Table V - Education and cognitive Function

Cognitive Functions	≤ PUC (n=28)		Degree (n=22)		Unpaired t Test	
	Mean	Std. Deviation	Mean	Std. Deviation	P value	Significance
CWIT Word	24.42	10.27	17.70	6.33	P<0.01	S
CWIT Color	56.49	14.82	51.36	37.01	0.506	NS
TMT-A	33.17	14.09	30.68	13.64	0.545	NS
TMT-B	71.92	30.63	67.55	30.49	0.618	NS
ROCF AT REGISTRATION	34.46	1.40	34.95	0.95	0.166	NS
ROCF at 3 MIN	19.00	5.10	17.52	5.81	0.434	NS
ROCF at 30 MIN	16.64	5.45	16.70	5.44	0.968	NS
NS = NOT SIG, S = SIG,						

On CWIT test word naming subtype more educated sample took significantly lesser time than less educated indicating better performance.

Table VI - Y-BOCS severity and Cognitive Performance
Table VIa CWIT - Time and Cognitive performance

TEST	YBOCS – SEVERITY				Mann-Whitney U test	
	Moderate (n=38)		Moderate-severe (n=12)			
	Mean	Std. Deviation	Mean	Std. Deviation	P value	Significance
CWIT word naming (seconds)	20.57	8.44	24.28	11.61	0.427	Not Sig
CWIT colour naming (seconds)	49.91	16.96	54.91	13.64	0.307	Not Sig

Table VIb: CWIT - Mistakes and Cognitive performance

Test	Mistakes	YBOCS – SEVERITY				Chi Square test
		Moderate (n=38)		Moderate-severe (n=12)		
		Count	%	Count	%	
CWIT word naming (seconds)	No	35	92	9	75	0.112, Not Sig
	Yes	3	8	3	25	
CWIT colour naming (seconds)	No	11	29	2	17	0.402, Not Sig
	Yes	27	71	10	83	

Table VIc - Performance on ROCF in Group A

TEST	YBOCS – SEVERITY				Independent t Test	
	Moderate (n=38)		Moderate-severe (n=12)			
	Mean	Std. Deviation	Mean	Std. Deviation	P value	Significance
ROCF Registration	34.76	1.22	34.42	1.31	0.403	Not Sig
ROCF 3 min	18.16	5.44	18.96	5.51	0.66	Not Sig
ROCF 30 min	16.59	5.45	16.92	5.41	0.86	Not Sig

Table VId: TMT- Time and Cognitive performance of Group A

TEST	YBOCS – SEVERITY				Mann-Whitney U test	
	Moderate (n=38)		Moderate-severe (n=12)			
	Mean	Std. Deviation	Mean	Std. Deviation	P value	Significance
TMT-A (seconds)	31.72	13.88	33.20	14.12	0.838	Not Sig
TMT-B (seconds)	67.40	27.35	78.23	38.53	0.633	Not Sig

Table VIe: TMT- Mistakes and Cognitive performance of Group A

Test	Mistakes	YBOCS – SEVERITY				Chi Square test
		Moderate (n=38)		Moderate-severe (n=12)		
		Count	%	Count	%	
TMT-A (seconds)	No	32	84	10	83	0.711,
	Yes	6	16	2	17	Not Sig
TMT-B (seconds)	No	11	29	3	25	0.863,
	Yes	27	71	9	75	Not Sig

There was no significant association between severity of OCD as measured by Y-BOCS and performance on various cognitive tasks.

DISCUSSION

This study was aimed to evaluate the cognitive functions of drug naïve patients having OCD. Cognitive functions were compared with sociodemographic profile and Y-BOCS severity.

In the current study younger subjects (18-27 years) had significantly poor performance on TMT suggesting impairment in spatial working memory. This is in contrast to the study by Tombaugh et al (2004) on normative data about trend of performance in different age groups wherein younger sample performed better on Trail making test with linear correlation between age and performance.[9] In the present study patients aged between 28-36yrs performed better than those aged between 36-45 years similar to study conducted on normal population by Tombaugh et al.[9] In the present study age was not significantly associated with motor & processing speed. According to Zimmermann when age alone was considered younger group performed better than the older group.[10] In the present study there was no association between age and visuospatial memory. However according to Gallagher younger people performed better than older people.[11]

Females performed better on motor and processing speed (CWIT colour naming). This result is in accordance to previous study on normative data trend on CWIT test conducted by Strikland et al (1997) wherein women demonstrated significantly better performance than men on the test scores.[12] No significant difference was observed in Visuoconstructive memory between the two genders. However a study by Gallagher reported men performed better than women on visuoconstructive memory tasks.[11]

More educated subjects performed better on motor and processing speed. This is in accordance to previous study by Zimmermann et al (2015) who reported that normal people who were less educated exhibited poorer performance on CWIT when compared to those who are more educated.[10]

No difference on motor & processing speed, spatial working memory and visuoconstructive memory was observed with Y-BOCS severity in group A. Study by Choi et al (2003) reported similar inference with no significant difference in performance observed on cognitive function compared to Y-BOCS severity score.[13] Study by Krishna et al (2011) reported no association between OCD severity and spatial working memory.[14] Rao et al (2008) also reported no association between severity of OCD and visuospatial memory.[15] On the contrary a meta-analysis by Abramovitch A et al (2015) reported poorer performance on TMT (A & B) and ROCF test with respect to Y-BOCS severity suggesting poor spatial working memory and visuoconstructive memory in severe cases of OCD.[16]

LIMITATIONS

1) Formal IQ assessment was not done and education status was used as a indicator of normal IQ levels.

2) Sample size was relatively small as only drug naïve patients were included.

3) Participants had difficulty in comprehending instructions of some tests even after meeting the criteria for minimum education for entry into the study.

4) A healthy control group was not included for comparison of cognitive performance.

5) Cognitive performance was assessed in a single session which might have resulted in mental fatigue affecting the performance.

DIRECTIONS FOR FUTURE RESEARCH

1) Applying neuroimaging studies along with the performance tests to assess the brain areas involved in a particular functioning.

2) Longitudinal assessment of cognitive performance after initiating the treatment for OCD.

3) Comparing the performance on various domains with a matched healthy control group to assess Cognitive performance.

4) Cognitive functions not assessed in the present study like attention and cognitive flexibility can also be included for assessment in future.

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REVIEW ARTICLE

Role of 3D/4D Sonography in Obstetrics and Gynaecology

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ABSTRACT

Modern 3D/4D sonography provides a routine single plane image as in 2D ultrasound as well as complete sets of volume data in the computer memory. After complete acquisition of all sets of volume, all data can be accessed from the memory and we can detect normal and abnormal findings in both obstetrics and gynecology in different display modes. Furthermore, we can perform examination of digital storage of volumes which permits virtual examinations by reloading of volumes and navigating them in the absence of the patient.

This review article will give insight of recent advances in technology of 3D/4D ultrasound in obstetrics and gynecology.

INTRODUCTION

First ultrasound machine (Combison 330) for medical imaging was launched by Kretztechnik AG, Austria in 1989. Initially many gynecologists were dubious about the clinical use of 3D/4D technique of sonography. Later on 3D/4D ultrasound found worldwide acceptance after 1997, when the First World Congress for 3D Sonography in Obstetrics and Gynecology held in Mainz, Germany[1].

The American Institute of Ultrasound in Medicine held a consensus conference in 2005, where 3D ultrasound was established an imaging tool for a huge number of obstetrical and gynecological conditions. However, 3D/4D technology is not only useful for prenatal diagnosis but also for gynecological ultrasound and breast ultrasound as well[2].

Technical aspects

Generally, 3D ultrasound examination consists of four main steps: data acquisition, 3D visualization, volume/image processing, and storing of volumes, rendered images or image/volume sequences.[3] Steps for acquisition of 3D/4D image by transvaginal/transabdominal sonography-

1. Data acquisition
a) Orientation in the 2D image
b) Definition of the region of interest (ROI)
c) Volume acquisition

2. 3D/4D visualization
a) Multiplanar display
b) Tomographic display
c) Surface-rendered image (surface mode, light mode, HD live mode)
d) Transparent display (maximum mode, X-ray mode)
e) Glass body display (combination of surface or transparent rendering and color Doppler)
f) Animated display (rendering of image sequences)
3. Volume/image processing
a) Electronic scalpel
b) Filtering
c) Contrast and brightness control
d) Color selection
4. Storage of volumes or rendered images or volume sequences

Volume rendered image storage - With the advent of newer technology 3D/4D intracavity transducer (5-9 MHz) are used for volume acquisition in gynecology and early pregnancy. 3D/4D abdominal probes (4-8 MHz) are necessary in later pregnancy and in large or highly located gynecologic tumors. A different 3D/4D transducer (6 to 12 MHz) is required for the breast examination.

Currently several display modes can be used to demonstrate the ROI in 3D and 4D (Table 1). This allows the operator to choose always the most appropriate mode for the visualization of normal or abnormal findings in obstetrics and gynecology.

Table 1: Overview on 3D/4D visualization modes

3D	4D
Multiplanar mode	Multiplanar mode
Multislice/TUI mode	Multislice/TUI mode
3D surface mode	3D surface mode
Transparent mode	Transparent mode
Glass body mode	Glass body mode
Inversion mode	Inversion mode
VCI mode	VCI mode
Omni View mode	Omni View mode
3D-animation (cine) mode	STIC mode
HD live mode	HD live mode

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With the latest development, known as the HD live technique, a step toward even more realistic visualization of the fetus can be achieved. HD live uses a movable virtual light source that can illuminate the examination object from all sides[3]. The reflection and scattering behavior of the structures in relation to the light direction is used for calculation of the brightness and shadow of the fetal surface.

The human skin-based color spectrum and the movable virtual light source allow almost photographic imaging of fetuses. 3D/4D technique can be used to detect with greater details and clarity of normal anatomical structures and congenital anomalies in early and late pregnancy (limb deformities, facial anomalies, and facial expression) (Fig 1 A & B). The virtual light source provides extraordinarily realistic imaging of fetuses like actual photographs[3].

Application of 3d/4d sonography in obstetrics

3D and 4D ultrasound play an important role in early demonstration of normal and abnormal findings in the first, second and third trimester. The various display options give opportunity to operator to choose that display mode which gives the best overview of the ROI. Adequate amniotic fluid pocket is required for the 3D/4D surface rendering of the structures being imaged[4]. With the help of the glass body mode by a combination of gray scale 3D ultrasound and color power Doppler the fetal/ embryonic circulation can be demonstrated.

Figure: 1A- Gray scale 2 D image in radial ray syndrome shows radial deviation of hand,

Figure:1B - Surface view (HD live) of a fetus with radial ray syndrome shows radial deviation of hand.

With the interactive display of 3D images, the examiner can demonstrate all types of visible abnormalities in the most appropriate mode, showing the extent of the lesion in all dimensions. Triplanar demonstration of a true midsagittal section is required for the exact measurement of nuchal translucency (NT) in the first trimaster[5,6]. In the late trimesters the multiplanar display mode is helpful identifying a flat fetal profile or micrognathia or pathologic brain structures like partial or completely absent corpus callosum or ventriculomegaly[7-10]. Neural tube defects, abdominal defects, abnormalities of the gender and defects of the limbs including hands and feet can be diagnosed more precisely by surface rendered images. Abnormal ossification of fetal skeleton e.g. abnormalities of the skull, spine, chest, pelvic bones and the long limb bones can be diagnosed by the transparent mode[11,12]. Complex fetal cardiac anomalies can be diagnosed by 3D/4D fetal echocardiography using STIC technique (Fig- 2)[13].

Application of 3d/4d sonography in gynecology

The main advantage of transvaginal 3D/4D ultrasonography is the ability to generate transverse sections of the true pelvis in addition to conventional sagittal and coronal scans. Also, the examiner can scroll through a stored volume millimeter by millimeter in all three planes and can rotate the volume in all three directions[14]. It helps to locate the lesion in all three planes. The ability to display all three orthogonal planes simultaneously on the monitor enables a precise volumetric analysis. A direct live image of organs such as the uterus can be obtained by 3D render surface view or transparent view. Exact diagnosis of uterine anomalies can be done by rotating the stored image in an upright position to display the endometrium in the coronal plane[15] (Fig 3 A & B)
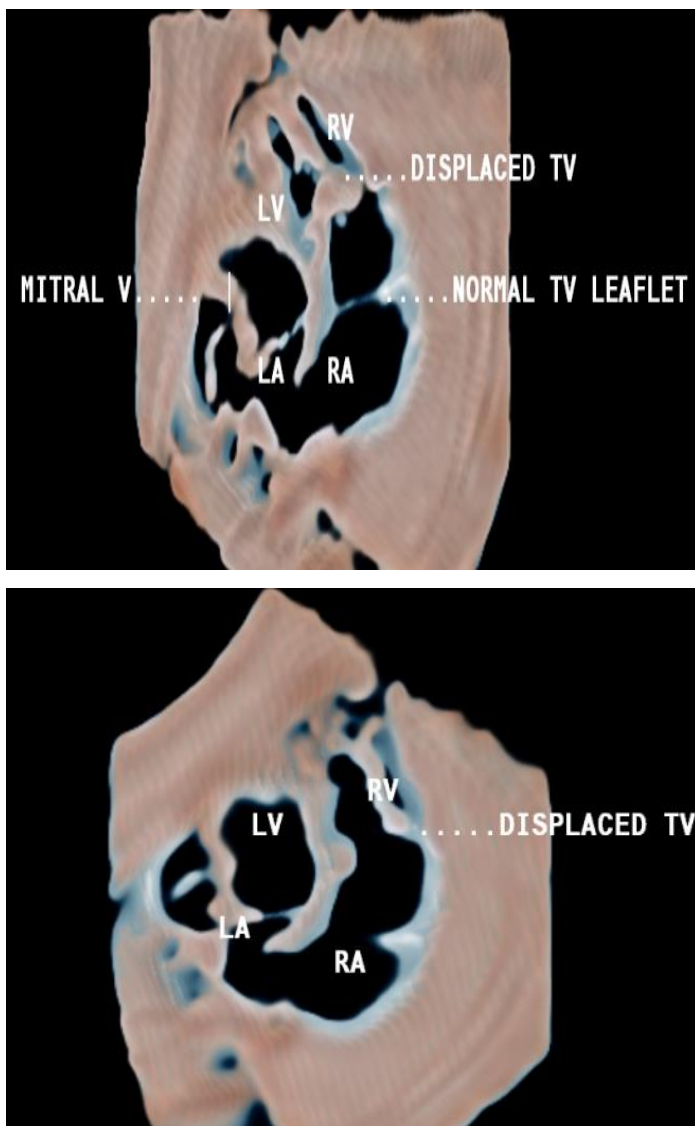
Figure: 2 STIC technology in a case of ebstein anomaly shows displaced tricuspid valve

3D sonography gives a clear picture of the inner and outer contour of the myometrium while even hystero-salpingography gives information about only the uterine cavity. Endometrial volumetry may be done in vitro fertilization therapy and in patients with suspected tumors. The exact coronal section makes it also possible to check precisely the position of an intrauterine device[16]. In the investigation of uterine tumors, fibroids can be accurately localized and their volume can be precisely determined. Glass-body rendering enables the operator to demonstrate uterine vascularity in three-dimensions. In particular neovascularization can be shown in endometrial and cervical cancer[17].

The ovaries can be depicted with the multiplanar and the surface mode. Both can be used to evaluate follicular maturation in spontaneous and stimulated cycles. The surface mode can be used to demonstrate cystic or solid tumors of the ovary and tumors of the fallopian tube. The glass body mode can provide impressive 3D views of the vascularity of benign tumors and neovascularity of borderline and malignant tumors of the ovary[17].

In infertility clinics, 3D ultrasound can be used to obtain sonographic views of the normal hystero-contrast sonography for the evaluation of the uterine cavity as well as fallopian tubes[17].
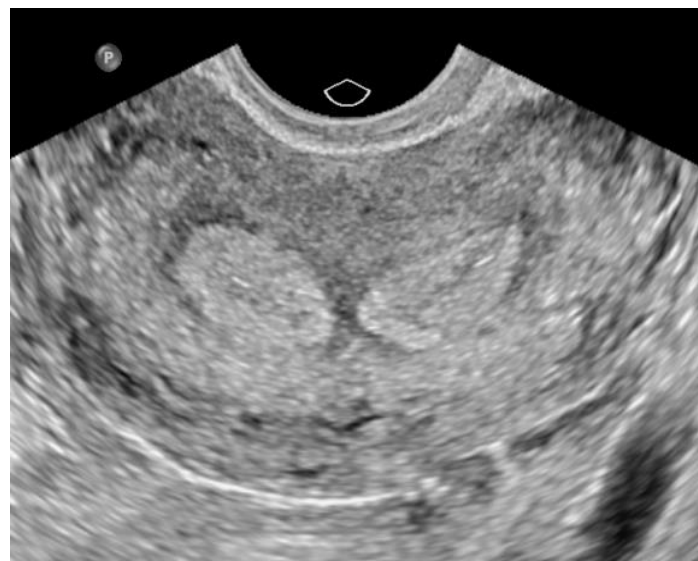

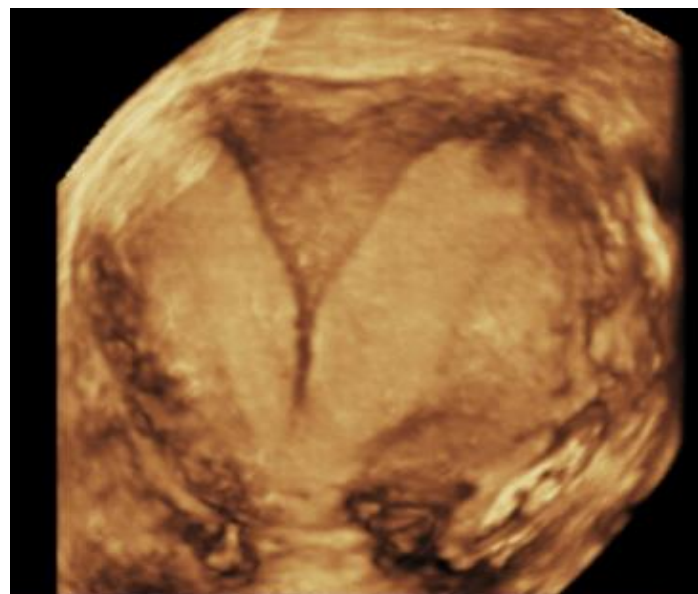Figure: 3 A- Gray scale images of septate uterus

Figure: 3 B- Surface-rendered image of septated uterus.

CONCLUSION

Twenty-seven years after the first introduction of 3D ultrasound into the clinical field of obstetrics and gynecology, 3D/4D sonography has experienced a wide spreading around the world. The easy handling of the ultrasound equipment, the variety of display modes after volume acquisition, the possibilities of volume manipulation and the advantage of storing volume data without any loss of quality provide the operator with an exceptional flexibility in daily routine examination. This is not only true in obstetrics but also in gynecology. However, 3D/4D ultrasound in obstetrics has the advantage that the fetus is

surrounded by amniotic fluid and that the demonstration of the outer surface of the fetus provides us with phenomenal images that are comparable to the pictures known from the textbook of embryology.

Future 3D/4D developments will be dependent from the progress in computer and transducer technology.

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REVIEW ARTICLE

Novel Drugs for Cessation of Smoking

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INTRODUCTION

Each year, 8 million premature deaths are caused by tobacco use worldwide[1]. Quitting smoking can lower these health risks and lengthen life expectancy, but more than 95% of unassisted attempts to stop smoking fail within six months due to tobacco's high level of addiction[2]. Nicotine interacts with nicotinic acetylcholine receptors (nAChRs) in the central nervous system to cause addiction. Several attempts to stop smoking are frequently necessary to achieve long-term tobacco abstinence, according to a significant body of evidence[3, 4].

Novel drugs for smoking cessation

1) Cytisinicline

It is a plant-based single enantiomer alkaloid whose molecular structure resembles nicotine, and cytisinicline and nicotine. It functions as a partial agonist, blocking nicotine from attaching to nicotinic acetylcholine receptors and causing the release of dopamine in mesolimbic loci, such as the amygdala[5-7].

Mechanism of action of Cytisinicline as a partial nAChR agonist in treating nicotine addiction is by two ways: 1) Some release of dopamine are maintained by its partial agonism effect (although lower than the level stimulated by nicotine) and therefore it reduces craving and other withdrawal symptoms 2) At the same time its partial antagonism effect reduces its nicotine binding, therefore reducing pleasure and other rewarding effects of smoking.

Cytisinicline has been approved and used as a smoking cessation medication in Europe since the 1980s, [8, 9] with an administration schedule consisting of 1.5-mg tablets in a downward titration, from 6 tablets/day to 1 tablet/day over a 25-day period.

810 adult smokers participated in the placebo-controlled ORCA-2 research (NCT04576949), which assessed the safety and effectiveness of cytisinicline for smoking cessation. Patients with an average age of 54 years were randomly assigned (1:1:1) to receive either placebo, or cytisinicline 3mg administered three times per day for either six or twelve weeks. Following the randomization, they were observed for 24 weeks to see if they had stopped smoking, and behavioural assistance was given throughout the trial[10].

Acetylcholinesterase inhibitors

Acetylcholinesterase inhibitors are used to treat cognitive impairments brought on by Alzheimer's disease[11]. They are reportedly successful at battling drug addiction, according to recent reports (including nicotine dependence). Acetylcholinesterase inhibitors, such as donepezil and galantamine, can decrease the amount of nicotine that rats self-administer[12,13]. Compared to the control group, the rivastigmine group significantly reduced daily cigarette smoking (30%), carbon monoxide exhaled (32%), and tobacco craving (18%) during the course of a 12-week, randomised, placebo-controlled experiment[14].

Agents affecting GABA receptors

GABA is a non-protein amino acid. It is a crucial neurotransmission inhibitor in the human brain. Through the allosteric regulation of a non-benzodiazepine site on the GABA-A receptor, topiramate promotes GABAergic neurotransmission. In a randomised, 10-week study, the prevalence of 4-week continuous abstinence was found to be 5% in the placebo group, 26% in the topiramate group, and 37% in the topiramate plus nicotine patch group. A difference between the topiramate plus nicotine patch and placebo groups was seen in 88 pairwise comparisons ($p = 0.042$), but not between the topiramate and placebo groups ($p = 0.18$)[15].

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N-Acetyl Cysteine (NAC)

NAC is a well-known, well-tolerated, and reasonably priced nutraceutical supplement that modifies immune-inflammatory, glutamatergic, neurotrophic, oxidative, and neurotrophic pathways while raising intracellular glutathione levels, an important antioxidant[16]. In a study conducted by Prado and colleagues, NAC treatment significantly decreased the number of cigarettes smoked each day as well as the amount of carbon monoxide inhaled (mean SD = 10.4 8.6 ppm in the NAC-treated group versus 1.5 4.5 ppm in the placebo group; mean SD = 10.9 7.9 in the NAC-treated group)[17].

Cytisine

Cytisine is a plant-based medication. In central and eastern Europe, it has been used for smoking cessation for more than 50 years. A two-arm, parallel-group, randomised, non-inferiority trial is now being conducted to examine the effectiveness, safety, and cost-effectiveness of cytisine with varenicline in the treatment of tobacco dependence.

Other agents

Table 1: Clinical trials for other agents are summarized.

Trial Drug/Phase	Author	Mechanism of action	Result of trial
Exenatide Phase I/II	Yammine	GLP-1 agonist	Recruiting
Guanfacine Phase II	MckeeSA	Alpha-2-adrenergic agonist	Active, not recruiting
Lorcaserin Phase II	Anderson D	Selective 5-HT (2C)agonist	Lorcaserin (10 mg, b.i.d.), 15.31%; Lorcaserin (10 mg, q.d.), 8.72%; placebo, 5.64%
Nadolol Phase II	Castro M	Nonselective beta-blocker	Nadolol, 61.6%; placebo, 50%
D-cycloserine Phase I/ II	Hill KP	Partial NMDA-agonist	D-cycloserine, 2.57 ± 3.63 cigarettes/day; placebo, 0.29 ± 0.25 cigarettes/day.
AZD8529 Phase II	Gyaw S	Positive allosteric modulator at the mGluR2 receptor	AZD8529 (low dose), 9.6%; AZD8529 (high dose), 10.0%.
GSK598809 Phase II	Fava M	D3 antagonist	GSK598809, 0%; placebo, 0%
Liraglutide Phase II	Ashare RL	Long-acting analogue of human GLP	Recruiting
AXS-05 Phase II	Davis JM	5-HT2A receptor antagonist	Active, Not recruiting
Doxazosin Phase II	Mckee SA	Selective antagonist at postsynaptic α1-adrenergic receptors.	Doxazosin (8 mg), 27.557 ± 6.409 (stress) and 23.776 ± 7.192 (neutral); doxazosin (4 mg) 32.128 ± 7.494 (stress) and 26.790 ± 8.410 (neutral); placebo, 11.304 ± 7.407 (stress) and 23.474 ± 8.312 (neutral)

CONCLUSION

It is undeniable that smoking is unhealthy. There is enough proof to conclude that smoking causes malignancies of the mouth, pharynx, larynx, lungs, and other organs. It is ideal for all healthcare professionals to be aware of every patient's smoking status and to offer every smoker suitable, comprehensive guidance on quitting. The use of NRT will be very beneficial for patients who want to stop smoking.

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CASE REPORT

Radial Ray Syndrome with Single Umbilical Artery

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ABSTRACT

3D Ultrasound antenatal examination is used for the assessment of abnormal anatomical findings. Radial ray defect can be diagnosed by using ultrasonography. Abnormal findings can be detected quickly by having the understanding of the etiology, pathophysiology and embryology. It is a rare congenital defect that may be isolated or associated with other anomalies including fanconi's syndrome and holt-oram syndrome[1]. We are reporting the case of a 28-year-old woman (G2P1L1) who presented for routine antenatal ultrasound. The patient did not have any antenatal anomaly scan. On ultrasound, gestational age of fetus was 25 weeks 3 days with short right forearm and absence of right radius with bowing of the ulna and radial deviated right hand (club hand) and associated single umbilical artery. Finding of the club hand diagnosed on 2D ultrasound was further confirmed on 3D ultrasound. Based on the finding of complete absence of radius this was diagnosed as unilateral type IV radial ray syndrome.

INTRODUCTION

Radial ray malformation refers to a spectrum of congenital anomalies that involve the radius, carpal bones or thumb. Multiple anomalies can be associated with radial ray defect. Abnormalities of any organ system, including musculoskeletal, spinal, cardiothoracic, gastrointestinal, or genitourinary can be associated with radial ray defects[2]. Radial Ray syndrome is rare malformation occurs in 1 in 30000 live births. Radial ray anomalies can be associated with a number of associations which include: Aase syndrome, Amniotic band syndrome, Cornelia de Lange syndrome (CDLS), Duane radial ray syndrome (DRRS), Fanconi anaemia, Holt-Oram syndrome, Nager syndrome, Omphalocele-radial ray (ORR) complex, Rothmund-Thomson syndrome (RTS), TAR syndrome, Trisomy 18 (Edwards syndrome), VACTERL association and Teratogen exposure in utero valproic acid and thalidomide.

On the extent of severity Radial ray syndrome can be classified into four main subtypes[3]:

1. Type I: Radius is slightly (>2 mm) short and the hand bends sideways at the wrist (often associated with a hypoplastic thumb); proximal radius is usually unaffected.

2. Type II: Radius bone is very short and the ulna curves sideways and supports the wrist poorly.

3. Type III: Partial absence of radius bone.

4. Type IV: Complete absence of radius bone.

CASE PRESENTATION

A 28-year-old woman of Indian origin, G2P1L1, presented to an obstetrical outpatient department for routine antenatal check-up. The patient's gestational history was unremarkable, with no significant past medical or surgical events. There was no significant history of drug intake. Her menstrual cycles were regular. No previous antenatal anomaly scan was done. Patient was referred to radiology department for antenatal scan. On ultrasound, gestational age of fetus was 25 weeks 3 days with short right forearm and absence of right radius with bowing of the ulna and radial deviated right hand (club hand) and associated single umbilical artery. The finding of the radial ray syndrome shown on 2D ultrasound was further confirmed on 3D ultrasound. Based on the finding of complete absence of radius this was diagnosed as unilateral type IV radial ray syndrome.
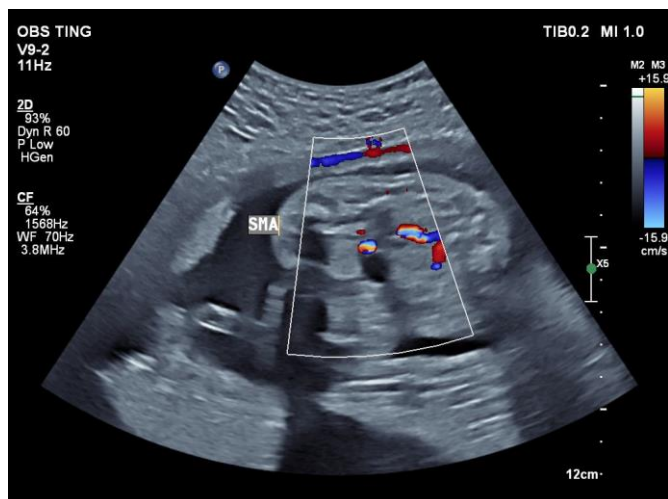

Figure 1: (A) - Gray scale ultrasound showing absent right radius bone.

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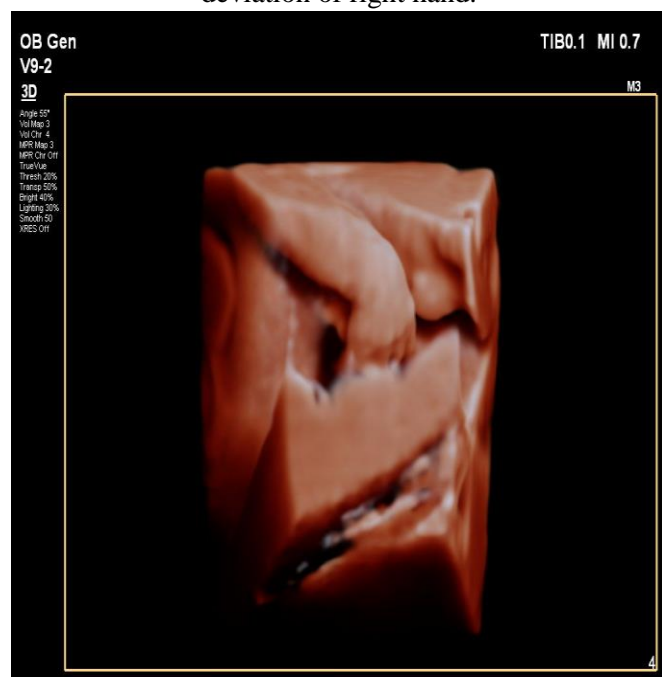**Corresponding author-**
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(B) - Colour doppler ultrasound showing single umbilical artery

Figure 2: (A) Gray scale ultrasound showing radial deviation of right hand.

(B) - 3D ultrasound image showing radial deviation of right hand (club hand)

CONCLUSION

Radial ray anomaly in combination with club hand is a rare and an interesting phenomenon which can be diagnosed in the prenatal period. Fetus discovered to have abnormal limbs/hands should be referred to a center for counseling to parents and family and ensure proper management and rehabilitation[4,5].

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CASE REPORT

Hypoplastic Left Heart Syndrome

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ABSTRACT

Hypoplastic left heart syndrome (HLHS) may result from errors in the early stages of cardiac development. HLHS represents a variety of cardiac malformations that include hypoplasia of the left ventricle, hypoplasia of ascending aorta and hypoplasia or atresia of the aortic and mitral valves. By the help of improved resolution of advanced sonography equipments a radiologist can diagnose the spectrum of HLHS. HLHS causes increase in neonatal morbidity and mortality. Hence there is a need for prenatal diagnosis of HLHS with ultrasound to detect cardiac anomalies. Prenatal diagnosis of this congenital cardiac anomaly also allows families to prepare for a child with a life-threatening defect by consultation with the multidisciplinary team for short- and long-term prognosis.

INTRODUCTION

Hypoplastic left heart syndrome (HLHS) is mostly a lethal condition. Spectrum of HLHS includes hypoplasia of the left ventricle and ascending aorta and hypoplasia or atresia of the aortic and mitral valves. The great vessels are normally positioned in HLHS. HLHS is the fourth most common cardiac malformation to manifest in the 1st year of life behind ventricular septal defect, d-transposition of the great arteries, and tetralogy of Fallot[1]. HLHS has a reported prevalence of 0.2 per 1,000 live births and occurs twice as often in boys as in girls[2,3]. Left untreated, HLHS is invariably lethal and is responsible for 25% of early cardiac deaths in neonates[4,5]. However, the recent evolution of palliative surgical procedures has increased the survival rate in children with these malformations.

CASE PRESENTATION

A 29 year-old primigravida of Indian origin, 34 weeks of amenorrhea presented to obstetrical outpatient department for routine antenatal check-up. The patient's obstetrical history was normal with no significant past medical or family history. There was no significant history of drug intake. Her menstrual cycles were regular. Her sonography findings were small thick wall left ventricle with small ascending aorta and normal pulmonary artery with ratio of aorta to pulmonary artery of 0.6, enlarged right heart chambers with reduced flow across mitral valve with normal left atrium and heart rate was 222 beats/min with regular rhythm.

DISCUSSION

HLHS is a complex combination of cardiac malformations that probably results from multiple developmental errors in the early stages of cardiogenesis. As fetal circulation allows normal growth and development of the fetus, the ductus arteriosus and elevation of pulmonary arterial pressures in the early postnatal period leads to poor perfusion of the coronary, cerebral and systemic circulations leading to severe congestive heart failure. If left untreated it may lead to premature death. A variety of chest radiographic findings are seen in patients with HLHS and multiple innovative surgical procedures are now available to prolong the lives of these patients. An awareness and understanding of the spectrum of radiographic findings in HLHS will help radiologist to better assist their colleagues in cardiology and cardiovascular surgery in caring for patients with this pathologic condition.

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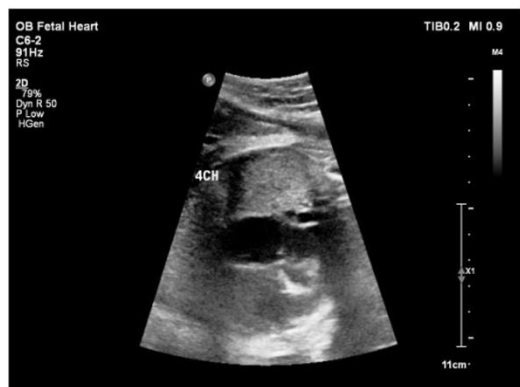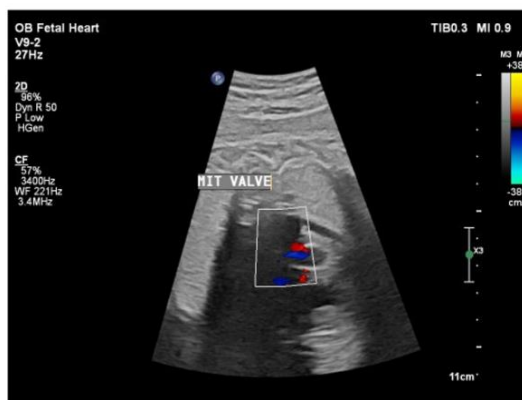Email: pankaj6468@gmail.com
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Figure 1: A- 4 chamber heart view shows small left ventricle with enlarged right chambers.
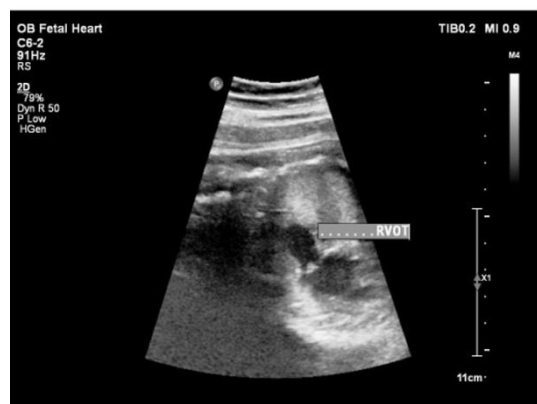

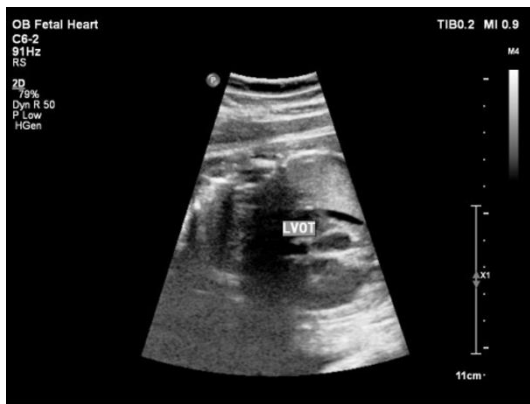B- Decreased flow across mitral valve.

Figure 2 : A- Normal RVOT

B- Narrow LVOT

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